

7.3 Solving Equations Using Quadratic Techniques

ex 1:

$$x^4 - 29x^2 + 100 = 0$$

$$u^2 - 29u + 100 = 0 \quad \text{Let } x^2 = u$$

$$(u - 25)(u - 4) = 0$$

$$u = 25 \quad u = 4$$

$$x^2 = 25 \quad x^2 = 4$$

$$x = \pm 5 \quad x = \pm 2$$

$$\{\pm 5, \pm 2\}$$

ex 2:

$$x^3 + 216 = 0$$

$$a = x$$

$$b = 6$$

Factor sum of cubes

$$(a^3 + b^3) =$$

$$(a+b)(a^2 - ab + b^2)$$

$$(x+6)(x^2 - 6x + 36) = 0$$

$$x = -6$$

$$x = \frac{6 \pm \sqrt{36 - 4(36)}}{2}$$

$$\{-6, 3 \pm 3i\sqrt{3}\}$$

$$\frac{6 \pm \sqrt{-108}}{2}$$

$$\frac{108}{3} = 36$$

$$\frac{6 \pm 6i\sqrt{3}}{2}$$

ex 3:

$$x^{\frac{1}{2}} - x^{\frac{1}{4}} - 6 = 0$$

$$\text{Let } u = x^{\frac{1}{4}}$$

$$u^2 - u - 6 = 0$$

$$(u - 3)(u + 2) = 0$$

$$u = 3 \quad u = -2$$

$$(x^{\frac{1}{4}})^4 = 3^4 \quad (x^{\frac{1}{4}})^4 = (-2)^4$$

$$x = 81$$

$$x = -16$$

$$\{81\}$$

Check w/ fractional exponents

ex 4:

$$x^{\frac{2}{3}} - 2x^{\frac{1}{3}} - 24 = 0$$

$$x = 216, -64$$

$$\left(\frac{-64}{-4}\right)^{\frac{2}{3}} - 2\left(\frac{-64}{-4}\right)^{\frac{1}{3}} - 24 = 0$$

$$16 + 8$$

$$-24$$

✓

ex 5:

$$x^5 - 81x = 0$$

$$x(x^4 - 81) = 0 \quad \text{Factor}$$

$$x(x^2 + 9)(x^2 - 9) = 0$$

$$x = 0 \quad x^2 = -9 \quad x^2 = 9$$

$$x = \pm 3i \quad x = \pm 3$$

$$\{0, \pm 3, \pm 3i\}$$

Another way to solve a radical equation

ex 6:

$$x + \sqrt{x} = 12$$

$$x + x^{\frac{1}{2}} - 12 = 0$$

$$x + \sqrt{x} - 12 = 0$$

$$u^2 + u - 12 = 0$$

$$(u + 4)(u - 3) = 0$$

$$u = -4 \quad u = 3$$

$$\sqrt{x} = -4 \quad \sqrt{x} = 3$$

$$x = 16 \quad x = 9$$

$$\sqrt{x}^2 = (12 - \sqrt{x})^2$$

$$x = 144 - 24\sqrt{x} + x$$

$$\text{Let } u = \sqrt{x}$$

HW

p363

11-15odd 18-20, 23,
27, 29 (grouping)